# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
## REQUEST FOR FILING NATIONAL PHASE OF
## PCT APPLICATION UNDER 35 U.S.C. 371 AND 37 CFR 1.494 OR 1.495

To:     Hon. Commissioner of Patents
        Washington, D.C. 20231

00909

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)

Atty Dkt:    **PM 276594**      /2980368US/VK/KP
                      M#          /Client Ref.

From:    Pillsbury Winthrop LLP, IP Group:          Date:    January 29, 2001

This is a **REQUEST** for **FILING** a PCT/USA National Phase Application based on:

| 1. | International Application | 2. | International Filing Date | 3. | Earliest Priority Date Claimed |
|---|---|---|---|---|---|

1.  International Application          2.  International Filing Date          3.  Earliest Priority Date Claimed

PCT/FI99/00649                        3    August    1999                    3    August    1998
⇧ country code                        Day   MONTH   Year                     Day   MONTH   Year
                                                                             (use item 2 if no earlier priority)

4.  Measured from the earliest priority date in item 3, this PCT/USA National Phase Application Request is being filed within:

   (a) ☐ 20 months from above item 3 date     (b) ☒ 30 months from above item 3 date,

   (c) Therefore, the due date (unextendable) is    February 3, 2001

5.  Title of Invention METHOD FOR IMPROVING THE PERFORMANCE OF USSD TRANSFER IN A CELLULAR COMMUNICATIONS SYSTEM

6.  Inventor(s)    TARNANEN, Teemu et al

Applicant herewith submits the following under 35 U.S.C. 371 to effect filing:

7.  ☒ Please immediately start national examination procedures (35 U.S.C. 371 (f)).

8.  ☐ **A copy of the International Application** as filed (35 U.S.C. 371(c)(2)) is transmitted herewith (file if in English but, if in foreign language, file only if not transmitted to PTO by the International Bureau) including:

   a. ☐ Request;
   b. ☐ Abstract;
   c. _____ pgs. Spec. and Claims;
   d. _____ sheet(s) Drawing which are ☐ informal ☐ formal of size ☐ A4 ☐ 11"

9.  ☒ **A copy of the International Application has been transmitted by the International Bureau.**

10. **A translation of the International Application** into English (35 U.S.C. 371(c)(2))
   a.  ☒    is transmitted herewith including:  (1) ☒ Request;  (2) ☒ Abstract;
              (3)   9   pgs. Spec. and Claims;
              (4)   1   sheet(s) Drawing which are:
                         ☐ informal ☒ formal of size ☒ A4 ☐ 11"
   b.  ☐    is not required, as the application was filed in English.
   c.  ☐    is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.
   d.  ☐    Translation verification attached (not required now).

RE: USA Nationál Filing of PCT ___/FI99/00649___

11. ☒ **PLEASE AMEND** the specification before its first line by inserting as a separate paragraph:
   - a. ☒ --This application is the national phase of international application PCT/FI99/00649 ___
     filed ___August 3, 1999___ which designated the U.S.--
   - b. ☐ --This application also claims the benefit of U.S. Provisional Application No.
     60/_____, filed _____ .--

12. ☐ Amendments to the claims of the International Application **under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., before 18th month** from first priority date above in item 3, are transmitted **herewith (file only if in English) including:**

13. ☒ PCT Article 19 claim amendments (if any) have been transmitted by the International Bureau

14. ☐ Translation of the amendments to the claims **under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., of claim amendments** made before 18th month, **is attached (required by 20th month from the date in item 3 if box 4(a) above is X'd, or 30th month if box 4(b) is X'd, or else amendments** will be considered **canceled).**

15. **A declaration of the inventor** (35 U.S.C. 371(c)(4))
   - a. ☒ is submitted herewith ☐ Original ☒ Facsimile/Copy
   - b. ☐ is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.

16. **An International Search Report (ISR):**
   - a. Was prepared by ☐ European Patent Office ☐ Japanese Patent Office ☒ Other
   - b. ☒ has been transmitted by the international Bureau to PTO.
   - c. ☒ copy herewith (2 pg(s).) ☒ plus Annex of family members (1 pg(s).).

17. **International Preliminary Examination Report** (IPER):
   - a. ☒ has been transmitted (if this letter is filed after 28 months from date in item 3) in English by the International Bureau with Annexes (if any) in original language.
   - b. ☒ copy herewith in English.
   - c.1 ☐ IPER Annex(es) in original language ("Annexes" are amendments made to claims/spec/drawings during Examination) including attached amended:
   - c.2 ☐ Specification/claim pages #_____ claims #
     Dwg Sheets #
   - d. ☐ Translation of Annex(es) to IPER **(required by 30th month due date, or else annexed amendments will be considered canceled).**

18. **Information Disclosure Statement** including:
   - a. ☒ Attached Form PTO-1449 listing documents
   - b. ☒ Attached copies of documents listed on Form PTO-1449
   - c. ☒ A concise explanation of relevance of ISR references is given in the ISR.

19. ☐ **Assignment** document and Cover Sheet for recording are attached. Please mail the recorded assignment document back to the person whose signature, name and address appear at the end of this letter.

20. ☐ Copy of Power to IA agent.

21. ☐ **Drawings** (complete only if 8d or 10a(4) not completed): ___ sheet(s) per set: ☐ 1 set informal; ☐ Formal of size ☐ A4 ☐ 11"

22. Small Entity Status ∅ ☒ is **Not** claimed ☐ is claimed (**pre-filing confirmation required**)
22(a) _____ (No.) Small Entity Statement(s) enclosed (since 9/8/00 Small Entity Statements(s) not essential to make claim)

23. **Priority** is hereby claimed under 35 U.S.C. 119/365 based on the priority claim and the certified copy, both filed in the International Application during the international stage based on the filing in (country) FINLAND of:

| Application No. | Filing Date | | Application No. | Filing Date |
|---|---|---|---|---|
| (1) 981692 | August 3, 1998 | (2) | | |
| (3) | | (4) | | |
| (5) | | (6) | | |

   - a. ☒ See Form PCT/IB/304 sent to US/DO with copy of priority documents. If copy has not been received, please proceed promptly to obtain same from the IB.
   - b. ☐ Copy of Form PCT/IB/304 attached.

RE: USA National Filing of PCT/FI99/00649

**525 Rec'd PCT/PTO 29 JAN 2001**

24. Attached: Copy of Finnish OA

25. **Preliminary Amendment:** Claims 3 & 4, line 1, delete " or 2 "
Claim 5, line 1, change " any one. . . claims " to -- claim 1 --

25.5 Per Item 17.c2, **cancel original** pages #_____, claims #_____, Drawing Sheets #

26. **Calculation of the U.S. National Fee (35 U.S.C. 371 (c)(1)) and other fees is as follows:**
Based on <u>amended</u> claim(s) per above item(s) ☐ 12, ☐ 14, ☐ 17, ☒ 25, ☐ 25.5 (hilite)

| | | | | | | |
|---|---|---|---|---|---|---|
| Total Effective Claims | 8 | minus 20 = | 0 | x $18/$9 = | $0 | 966/967 |
| Independent Claims | 3 | minus 3 = | 0 | x $80/$40 = | $0 | 964/965 |
| If any proper (ignore improper) Multiple Dependent claim is present, | | | add$270/$135 | +0 | | 968/969 |

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(4)): ➜➜ **BASIC FEE REQUIRED, <u>NOW</u>** ➜➜➜➜ ↓

A. If country code letters in item 1 are **not** "US","BR","BB","TT","MX","IL" "NZ", "IN" or "ZA" ↓↓

See item 16 re: ↓
1. Search Report was <u>not prepared</u> by EPO or JPO - - - - - - - - add$1000/$500       960/961
2. Search Report was prepared by EPO or JPO - - - - - - - - - - - add$860/$430   +1000     970/971

**SKIP B, C, D AND E UNLESS country code letters in item 1 are "US","BR","BB","TT","MX","IL", "NZ", "IN" or "ZA"** ↓

➜ ☐ B. If <u>USPTO</u> did not issue <u>both</u> International Search Report
(X) (ISR) <u>and</u> (if box 4(b) above is X'd) the International add$970/$485   +0     960/961
Examination Report (IPER), - - - - - - - - - - - - - - - - - -

(only)
(one) ➜ ☐ C. If <u>USPTO</u> issued ISR but not IPER (or box 4(a) above is
(of) X'd), - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - add$710/$355   +0     958/959

(these)
( 4) ➜ ☐ D. If <u>USPTO</u> issued IPER but IPER Sec. V boxes <u>not all</u> 3
(boxes) YES, - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - add$690/$345   +0     956/957

➜ ☐ E. If international preliminary examination fee was paid to
<u>USPTO</u> and Rules 492(a)(4) and 496(b) <u>satisfied</u> (IPER       962/963
Sec. V <u>all</u> 3 boxes YES for <u>all</u> claims), - - - - - - - - - - - - add $100/$50   +0

27.      **SUBTOTAL =**   $1000

28. If Assignment box 19 above is X'd, add Assignment Recording fee of - - - - $40   +0     (581)

29. Attached is a check to cover the - - - - - - - - - - - - - - - - - - - - - **TOTAL FEES**   $1000

Our Deposit Account No. 03-3975

| Our Order No. | 60258 | 276594 |
|---|---|---|
| | C# | M# |

**00909**

**CHARGE STATEMENT:** The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 and 492 (missing or insufficient fee only) now or hereafter relative to this application and the resulting Official document under Rule 20, or credit any overpayment, to our Account/Order Nos. shown above for which purpose a <u>duplicate</u> copy of this sheet is attached.
This CHARGE STATEMENT <u>does</u> <u>not</u> <u>authorize</u> charge of the <u>issue</u> <u>fee</u> until/unless an issue fee transmittal form is filed

**Pillsbury Winthrop LLP**
**Intellectual Property Group**

By Atty: Richard C. Irving     Reg. No. 38499

Sig: *[signature]*     Fax: (202) 822-0944

Atty/Sec: RCI/mhn     Tel: (202) 861-3788

**NOTE:** File in <u>duplicate</u> with 2 postcard receipts (PAT-103) & attachments.

Document5                 PAT-112CN 10/00

# METHOD FOR IMPROVING THE PERFORMANCE OF USSD TRANSFER IN A CELLULAR COMMUNICATIONS SYSTEM

## BACKGROUND OF THE INVENTION

The invention relates to improving the performance of USSD (Unstructured Supplementary Service Data) transfer in a cellular communica-
5 tions system, such as GSM (Global System for Mobile Communication).

The user of a mobile station (MS) can use USSD to give instructions to the supporting PLMN (Public Land based Mobile Network). For example, incoming calls can be routed to number 123456 by dialling *21*#123456#. USSD is also one of the mechanisms for implementing new services. USSD
10 allows an MS and a service application to communicate with each other by character strings, in a way which is transparent to the MS and to the intermediate network elements. USSD can be used as a narrow-band bearer for over-the-air (OTA) and value-added services (VAS) applications. With respect to a more detailed description of the USSD, reference is made to the following
15 ETSI GSM recommendations: GSM 02.90: *European digital cellular telecommunications system (Phase 2); Stage 1 description of Unstructured Supplementary Service Data (USSD)*, GSM 03.90: *Digital cellular telecommunications system (Phase 2); Unstructured Supplementary Service Data (USSD) - Stage 2*, and GSM 04.90: *European digital cellular telecommunications system
20 (Phase 2); Unstructured Supplementary Service Data (USSD) - Stage 3*. USSD requests, notifications and responses contain a USSD string, an alphabet indicator and a language indicator, as defined in GSM 03.38.

USSD signalling may be initiated by the mobile station or by the network. Phase 1 supports only MS-initiated USSD. Network-initiated USSD
25 service requires that all parts of the mobile communications system be at least phase 2 systems. The mobile communications network may at any time send a USSD message to a mobile station MS registered with the network in order to transmit information to the subscriber. This operation may be either a request (asking the MS to provide information) or a notification (requiring no in-
30 formation to be provided by the MS). No prior provisioning of USSD is required, although provisioning of services which make use of USSD may be required.

According to the above ETSI recommendations, USSD signalling takes place between an MS and an MSC/VLR (Mobile services Switching
35 Centre/Visitor Location Register) or HLR (Home Location Register). USSD supports a maximum of 160 bytes of user data per message. (The upper limit

2

can be less than 160 bytes depending on the underlying protocol layers.) Unlike SMS (Short Message Service), USSD has no store-and-forward functionality: mobile-terminated USSD messages are delivered to the MS immediately, or the delivery fails (e.g. because the MS is unreachable).

5          For the purposes of this application, a GSM-type mobile station has two modes: a call mode and an idle mode. A mobile station is in call mode if and only if it is "in a call", which state is defined in the GSM recommendation 02.30.

According to the above ETSI recommendations, USSD transfer
10   takes place on two different channels depending on whether or not the MS is in call mode or idle mode. In call mode, Fast Associated Control Channel (FACCH) is used. In idle mode, Slow Dedicated Control Channel (SDCCH) is used.

The speed of the FACCH channel is approximately 140 bytes per
15   second and that of the SDCCH channel approximately 83 bytes per second. Thus, even in idle mode, any USSD message can be delivered in less than two seconds.

It is conceivable that the use of USSD for implementing value-added and over-the-air services will increase. In this case, especially if multiple
20   consecutive USSD messages are needed, the slow transfer speed of the SDCCH channel could be seen as a problem. (It should be noted that for keeping the description compact, FACCH is used as a synonym for the fast channel, and SDCCH is used as a synonym for the slow channel. However, FACCH and SDCCH are terms used in the GSM system and its derivatives,
25   but these terms are not necessarily used in future cellular systems.)

BRIEF SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to study whether the speed of USSD in idle mode can be improved, and if yes, to provide a method and equipment for improving the speed of USSD in idle mode. The
30   object is achieved with a method and equipment which are characterized by what is disclosed in the attached independent claims. Preferred embodiments are disclosed in the attached dependent claims.

A straightforward way of improving the speed of USSD transfer would be to specify that all USSD traffic takes place on the fast FACCH chan-
35   nel. This would, however, require changes in existing standardisation. Also, FACCH is not a dedicated channel, but an associated one, which means that it

is implemented by stealing bits from the speech channel, if one exists. If such bit stealing is allowed to go on for long periods of time, it will degrade speech quality to some extent.

5   The invention is based on locating the problem and finding a solution for it. The solution is based on the idea that the amount of USSD data is determined, and if the amount exceeds (or is likely to exceed) a predetermined threshold (i.e. for lengthy USSD transmissions), the faster FACCH channel is activated by directing the MS into call mode. A simple way of accomplishing this is performing an unsuccessful call attempt.

10   Thus it can also be said that the invention is based on a novel interpretation of call mode, as specified in the above-referenced GSM recommendation 02.30, wherein call mode is defined as follows: *A mobile station is in a call from the time that signalling related to the establishment or attempted establishment of a mobile originated or mobile terminated call commences, and* 15 *before the call or call attempt ends, and (if applicable), the mobile equipment has stopped generating tones related to this call to the user.* Fooling the MS into call mode (by performing an unsuccessful call attempt) activates the faster FACCH channel for USSD transfer. However, it should be noted that the mobile station is "in a call" as defined by ETSI GSM 02.30, whereby the invention 20 requires no deviations from existing standards. Thus the method and equipment according to the invention solve the problem of the prior art USSD transfer in an elegant manner.

The invention is also based on determining the amount of USSD data (i.e. the length of USSD transmission) and using the FACCH channel 25 only for lengthy USSD transmissions. Performing an unsuccessful call attempt for short USSD transmissions would create unnecessary signalling load, which is especially harmful at the air interface. This signalling load must be balanced against the savings in time brought about by the mechanism of the invention. For example, FACCH could be used only if using it saves at least one second. 30 Because FACCH transfer is approximately 1.7 times faster than SDCCH transfer, it saves about 40% of the time needed by the SDCCH transfer. If it is required that at least one second must be saved, a minimum length for a USSD message would be 250 bytes. This exceeds the length of a single USSD message. In other words, performing the unsuccessful call attempt is 35 useful only with multiple consecutive USSD messages (assuming 83 and 140 bytes per second for SDCCH and FACCH, respectively, and a minimum sav-

ing of one second). Of course, it must be remembered that initiating the un-successful call attempt wastes a fraction of a second. Thus the logic for initiating the unsuccessful call attempt should be placed at the top of the protocol stack, i.e. in the application layer. Otherwise the logic will not know that multi-
5 ple USSD messages are needed.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The method and the equipment according to the invention will be described in more detail by means of a preferred embodiment with reference to the appended drawing on which:
10 Fig. 1 is a signalling diagram illustrating mobile-originated USSD transfer; and

Figs. 2 and 3 are signalling diagrams illustrating network-originated USSD transfer.

## DETAILED DESCRIPTION OF THE INVENTION

15 Fig. 1 is a signalling diagram illustrating mobile originated USSD transfer. Time advances from top to bottom. A USSD dialogue between two parties will be described. One of the parties is a mobile station MS and the other is a part or an element of a public land based mobile network PLMN serving that MS. The MS can be a small handportable cellular radio telephone
20 but the invention is best utilised if the mobile station comprises or is associated with data processing equipment. An example of such a mobile station is Nokia Communicator 9000. Another example is a general-purpose portable computer connected with a Nokia Cellular Datacard to a cellular radio telephone with a suitable interface, such as Nokia 2110 or 8110. All Nokia equip-
25 ment is available from Nokia Mobile Phones, Finland.

In step 1-2 a mobile station MS in idle mode determines that the length of the USSD transfer exceeds a predetermined threshold, which could be approximately 250 bytes. In step 1-4 the MS initiates a call attempt that ultimately should fail. One way of achieving this is calling a non-existent num-
30 ber. Alternatively, the MS could call itself. (At some later stage, the network PLMN will reply that the called subscriber does not answer, but this reply is not significant for understanding the invention.) Steps 1-6 through 1-12 constitute a mobile-originated USSD dialogue which is known per se. In step 1-6 the MS initiates the USSD dialogue by sending a BEGIN, INVOKE PROCESSUSSD-
35 REQUEST message to the network. (The primed message 1-4' will be explained

later.) In step 1-8 the network responds with a CONTINUE, INVOKEUSSD-REQUEST message. In step 1-10 the MS sends a CONTINUE, RESULT USSDREQUEST message. The symbol "N*" indicates that the dialogue can comprise multiple pairs of messages 1-8 and 1-10. Finally, in step 1-12, the
5  USSD dialogue is terminated by an END, RESULT PROCESSUSSDREQUEST message from the network.

The primed message 1-4' relates to an alternative embodiment of the mobile-originated USSD transfer according to the invention, wherein the call attempt 1-4 is not performed before message 1-6 but only after it. In this
10 case, the call attempt is shown with reference number 1-4'. In other words, it is also possible for a mobile station to initiate the USSD dialogue in step 1-6 before performing the call attempt in step 1-4'. Thus steps 1-4' and 1-6 are not performed in numerical order.

The lower limit for activating the FACCH channel can be fixed, e.g.
15 approximately 250 bytes (which corresponds to a saving of one second over SDCCH). Alternatively, the lower limit can be an adjustable network parameter which the network distributes by some suitable means, such as broadcasting, short message service, multipoint transmission (in packet radio networks), etc.

Fig. 2 is a signalling diagram illustrating a simple embodiment of a
20 network-originated USSD transfer according to the invention. Messages with identical reference numbers to those in Fig. 1 have identical function and will not be described again. Step 2-2 corresponds to step 1-2 but in this case, the network determines that the mobile station MS is in idle mode and the length of the USSD transfer justifies the use of the faster FACCH channel (i.e. it ex-
25 ceeds a lower limit). In step 2-4 the network initiates a call attempt. However, unlike step 1-4 shown in Fig. 1, the network cannot call a non-existent number (obviously, because the MS would not be alerted). Instead, the network can send to the MS a PAGE message in step 2-4. Steps 2-6 through 2-12 constitute a network-originated USSD dialogue which is known per se. In step 2-6 the
30 network initiates the USSD dialogue by sending a BEGIN, INVOKE USSDREQUEST message to the MS. The primed message 2-4' relates to an alternative embodiment wherein the PAGE message is sent after the message 2-6, like the alternative setup message 1-4' in Fig. 1. Messages 1-8 and 1-10 have already been explained. In step 2-12, the USSD dialogue is terminated
35 by an END message.

6

Fig. 3 is a signalling diagram illustrating a preferred embodiment of a network-originated USSD transfer according to the invention. The simple embodiment shown in Fig. 2 has the problem of confusing the user of the MS by the unsuccessful call attempt. The preferred embodiment shown in Fig. 3

5   eliminates this problem by converting a network-originated call attempt to a mobile originated one. In step 3-2 the network PLMN sends to the MS an indication that the MS must initiate a call setup procedure for activating the FACCH channel. This indication can be embedded, for example, inside a protocol-specific header or parameter in an appropriate WAP (Wireless Applica-

10  tion Protocol) layer. In the embodiment shown in Fig. 3, this indication has been embedded in the BEGIN, INVOKE USSDREQUEST message which was shown as step 2-6 in Fig. 2. In step 1-4 the MS initiates the unsuccessful call attempt by sending a SETUP message. The remainder of the procedure is similar to the one described in connection with Fig. 2.

15      The preferred embodiment of the network-originated USSD transfer has several advantages over the simple embodiment. For example, no special call setup routines are required in the network. Also, because the MS does not have to be paged, call setup is faster and the user of the MS is not alerted.

The invention requires neither hardware changes nor changes to

20  existing GSM standards. The invention can be implemented as software routines in a mobile station and/or the  Public Land based Mobile Network PLMN. In the mobile station, the software routine can be installed in the cellular telephone proper, or in the associated computer, if any. Installing the software routine in the associated computer, if applicable, is advantageous in the sense

25  that such software has a better chance of knowing or predicting the total number of USSD messages that will follow, and their combined length. Alternatively, the software routine according to the invention can be installed in the cellular telephone proper but the associated computer could give the software routine an indication that several USSD messages are likely to follow and the

30  FACCH channel should be activated.

In the PLMN, the invention is preferably implemented in a more distributed manner. The logic for determining if multiple USSD messages will be needed must be placed near the actual application. Typical network elements for executing OTA and VAS applications include Mobile services Switching

35  Centres, USSD centres, Home Location Registers and Visitor Location Registers of cellular communications systems and Service Control Points of intelli-

gent networks. The logic for performing the unsuccessful call attempt, as described in connection with Figs. 2 and 3, is preferably installed in a Mobile services Switching Centre. Other possible locations include a BTS (Base Transceiver Station), a BSC (Base Station Controller), and/or an RNC (Radio

5   Network Controller).

The invention has been described, by way of example, in connection with the GSM cellular system (Global System for Mobile Communication). The invention is equally applicable in connection with the derivatives of GSM, such as DCS (also known as GSM 1800), and any digital mobile communica-

10  tions network supporting USSD transfer on a fast channel if a mobile station is in a call, and otherwise on a slow channel.

8

CLAIMS

1. A method for setting up USSD transfer for transmitting data be-
tween two parties, namely a mobile station (MS) and a cellular communica-
tions network (PLMN), wherein the USSD transfer takes place on a fast chan-
5    nel (FACCH) if the mobile station is involved in a call, and otherwise on a slow
channel (SDCCH);
        the method being c h a r a c t e r i z e d  in that:
        the amount of data to be transmitted is determined (1-2, 2-2); and
        if the amount of data to be transmitted is likely to exceed a prede-
10   termined threshold, and if the mobile station (MS) is not involved in a call, the
mobile station (MS) is directed to call mode for switching the USSD transfer to
the fast channel (FACCH).

2. A method as claimed in claim 1, c h a r a c t e r i z e d  in that the
mobile station is directed into call mode by initiating a call attempt (1-4, 1-4'; 2-
15   4, 2-4').

3. A method as claimed in claim 1 or 2, c h a r a c t e r i z e d  in that
the party (MS, PLMN) that initiates the USSD transfer also initiates the call
attempt (1-4, 1-4'; 2-4, 2-4').

4. A method as claimed in claim 1 or 2, c h a r a c t e r i z e d  in that
20   the network (PLMN), when initiating the USSD transfer, sends the mobile sta-
tion (MS) an indication (3-2) that the mobile station (MS) must initiate the call
attempt (1-4, 1-4').

5. A method as claimed in any one of the preceding claims,
c h a r a c t e r i z e d  in that the mobile station (MS), when initiating the call
25   attempt (1-4, 1-4'), calls a non-existent number or itself.

6. A mobile station (MS), adapted for setting up USSD transfer for
transmitting data between itself and a cellular communications network
(PLMN), wherein the USSD transfer takes place on a fast channel (FACCH) if
the mobile station is involved in a call, and otherwise on a slow channel
30   (SDCCH);
        c h a r a c t e r i z e d  in that the mobile station (MS) is adapted to:
        determine (1-2) the amount of data to be transmitted; and

initiate a call attempt (1-4, 1-4') for switching the USSD transfer to the fast channel (FACCH) if the amount of data to be transmitted is likely to exceed a predetermined threshold and if the mobile station (MS) is not involved in a call.

5        7. An arrangement for a cellular communications network (PLMN), adapted for setting up USSD transfer for transmitting data between itself and a mobile station (MS), wherein the USSD transfer takes place on a fast channel (FACCH) if the mobile station (MS) is involved in a call, and otherwise on a slow channel (SDCCH);

10            c h a r a c t e r i z e d  in that the arrangement is adapted to:
            determine (2-2) the amount of data to be transmitted; and
            initiate a call attempt (1-4, 1-4'; 2-4, 2-4') for switching the USSD transfer to the fast channel (FACCH) if the amount of data to be transmitted is likely to exceed a predetermined threshold and if the mobile station (MS) is not
15  involved in a call.

        8. An arrangement as claimed in claim 7, c h a r a c t e r i z e d  in that it is adapted to initiate a call attempt (1-4, 1-4') by sending to the mobile station (MS) an indication (3-2) that the mobile station (MS) must initiate the call attempt.

**Fig. 1**

MS                                                                    PLMN

1-2: Determine that MS is not in a call
and the length of the USSD transfer
exceeds a lower limit

1-4: Setup

1-6: Begin, Invoke ProcessUSSDRequest

1-4': Setup

1-8: Continue, Invoke USSDRequest

1-10: Continue, Result USSDRequest

1-12: End, Result ProcessUSSDRequest

N*

**Fig. 2**

MS                                                    PLMN

2-2: Determine...

2-4: Page

2-6: Begin, Invoke USSDRequest

1-10: Continue, Result USSDRequest

2-4': Page

1-8: Continue, Invoke USSDRequest

1-10: Continue, Result USSDRequest

2-12: End

N*

**Fig. 3**

MS                                                    PLMN

2-2: Determine...

3-2: Begin, Invoke USSDRequest(Initiate Call Attempt)

1-10: Continue, Result USSDRequest

1-4: Setup

1-8: Continue, Invoke USSDRequest

1-10: Continue, Result USSDRequest

2-12: End

N*

FOR UTILITY/DESIGN
CIP/PCT NATIONAL/PLANT
ORIGINAL/SUBSTITUTE/SUPPLEMENTAL
DECLARATIONS

RULE 63 (37 C.F.R. 1.63)
DECLARATION AND POWER OF ATTORNEY
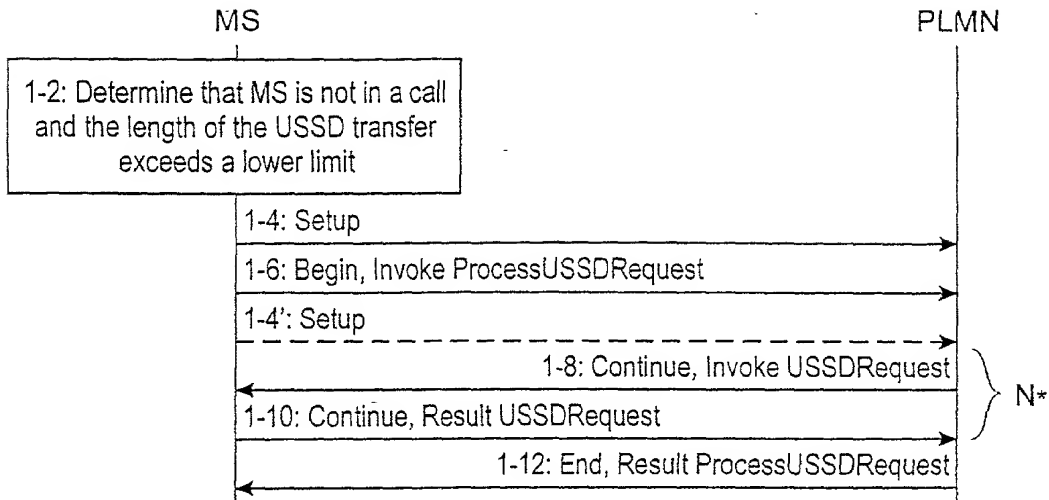FOR PATENT APPLICATION
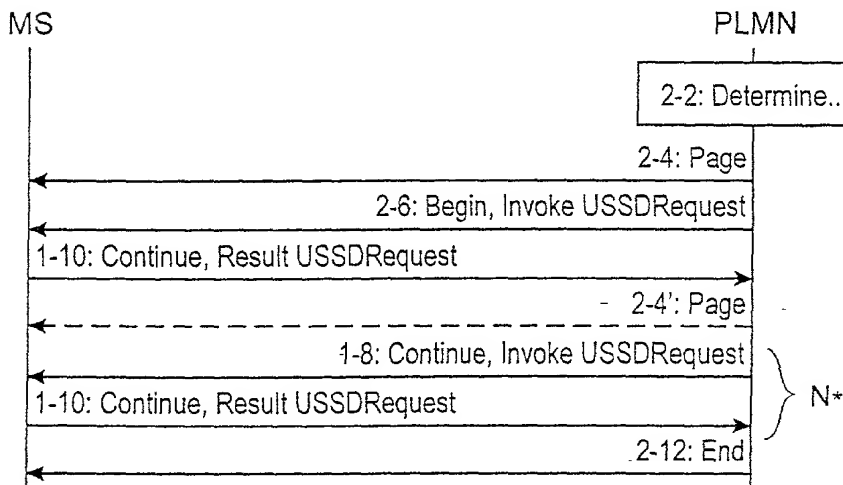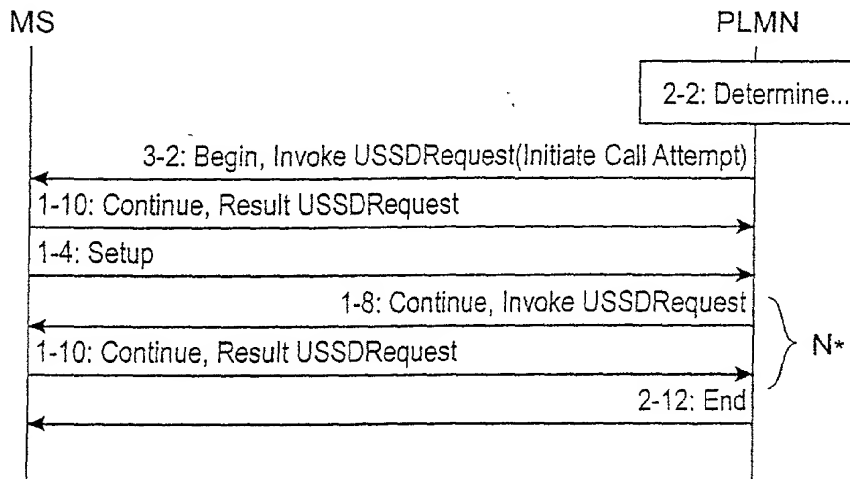IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

FORM

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the INVENTION ENTITLED

**Method for improving the performance of USSD transfer in a cellular communications system**
the specification of which (CHECK applicable BOX(ES))

X
→ A. ☐ is attached hereto.
BOX(ES)
→ B. ☐ was filed on _____ as U.S. Application No. _____ /
→ C. ☒ was filed as PCT International Application No. PCT/ FI99 100649 on 3 August 1999
and (if applicable to U.S. or PCT application) was amended on _____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56. I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International Application which designated at least one other country than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT International Application, filed by me or my assignee disclosing the subject matter claimed in this application and having a filing date (1) before that of the application on which priority is claimed, or (2) if no priority claimed, before the filing date of this application:

**PRIOR FOREIGN APPLICATION(S)**

| Number | Country | Day/MONTH/Year Filed | Date first Laid-open or Published | Date Patented or Granted | Priority Claimed Yes | No |
|---|---|---|---|---|---|---|
| 981692 | Finland | 3 August 1998 | | | X | |

I hereby claim domestic priority benefit under 35 U.S.C. 119(e) or 120 and 365(c) of the indicated United States applications listed below and PCT international applications listed above or below and, if this is a continuation-in-part (CIP) application, insofar as the subject matter disclosed and claimed in this application is in addition to that disclosed in such prior applications, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56 which became available between the filing date of each such prior application and the national or PCT international filing date of this application:

**PRIOR U.S. PROVISIONAL, NONPROVISIONAL AND/OR PCT APPLICATION(S)**

| Application No. (series code/serial no.) | Day/MONTH/Year Filed | Status pending, abandoned, patented | Priority Claimed Yes | No |
|---|---|---|---|---|
| | | | | |

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

And I hereby appoint Pillsbury Madison & Sutro LLP, Intellectual Property Group, 1100 New York Avenue, N.W., Ninth Floor, East Tower, Washington, D.C. 20005-3918, telephone number (202) 861-3000 (to whom all communications are to be directed), and the below-named persons (of the same address) individually and collectively my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and with the resulting patent, and I hereby authorize them to delete names/numbers below of persons no longer with their firm and to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct the above firm and/or a below attorney in writing to the contrary.

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| Carl G. Love | 18781 | Kendrew H. Colton | 30368 | Ruth N. Morduch | 31044 | Adam R. Hess | 41835 |
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(FOR ADDITIONAL INVENTORS, check box ☐ to attach PAT 116-2 same information for each re signature, name, date, citizenship, residence and address.)

PAT-116 7/99

KOKON.SIVUMÄÄRÄ 02